

**WHAT IS CLAIMED IS:**

- 1           1.       An integrated circuit fabrication process, the process comprising:  
2                    exposing a photoresist material provided including arylalkoxysilane  
3       over a substrate to a first radiation at a first lithographic wavelength;  
4                    selectively transforming a top portion of the material in accordance  
5       with a pattern provided on a mask or reticle; and  
6                    exposing the photoresist material to a second radiation at a second  
7       lithographic wavelength,  
8                    wherein the first lithographic wavelength is shorter than the second  
9       lithographic wavelength and the transformed top portion of the photoresist material  
10      being non-transparent to the second radiation.
- 1           2.       The process of claim 1, wherein the first lithographic wavelength is  
2       selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.
- 1           3.       The process of claim 1, wherein the second lithographic wavelength  
2       is selected from a wavelength including 365 nm, 248 nm, and 193 nm.
- 1           4.       The process of claim 1, wherein the exposing step with the first  
2       radiation is performed before the exposing step with the second radiation.
- 1           5.       The process of claim 1, further comprising providing the transformed  
2       top portion of the photoresist material as a self-aligned mask for the exposing step  
3       with the second radiation.
- 1           6.       The process of claim 1, wherein the photoresist material is a positive  
2       photoresist material.
- 1           7.       The process of claim 1, wherein the transformed top portion of the  
2       photoresist material comprises polymerized organoarylalkoxysilane material.

1           8.     The process of claim 7, wherein the thickness of the transformed top  
2     portion is at least 10 nm.

1           9.     The process of claim 1, further comprising transferring the pattern of  
2     the mask or reticle onto the photoresist material, wherein a resolution of the  
3     transferred pattern is determined by the first lithographic wavelength.

1           10.    An integrated circuit fabrication system, comprising:  
2                   a first light source providing a first radiation at a first lithographic  
3     wavelength;  
4                   a second light source providing a second radiation at a second  
5     lithographic wavelength; and  
6                   a self-aligned mask included in a photoresist layer, the self-aligned  
7     mask formed by exposure to the first radiation at the first lithographic wavelength in  
8     accordance with a patterned mask or reticle.

1           11.    The system of claim 10, wherein the first lithographic wavelength is  
2     smaller than the second lithographic wavelength.

1           12.    The system of claim 11, wherein the first lithographic wavelength is  
2     selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1           13.    The system of claim 11, wherein the second lithographic wavelength  
2     is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1           14.    The system of claim 10, wherein the photoresist layer is comprised of  
2     positive photoresist material.

1           15.    The system of claim 10, wherein the self-aligned mask comprises at  
2     least one cross-linked and or polymerized area of a top arylalkoxysilane layer.

1           16.    The system of claim 15, wherein the self-aligned mask is located at  
2   the top portion of the photoresist layer and has a thickness between 10 nm and  
3   10000 nm.

1           17.    The system of claim 16, wherein each of the polymerized area  
2   prevents the second radiation from transforming the portion of the photoresist layer  
3   correspondingly underneath.

1           18.    A method of extending the use of 248 nm and 193 nm photoresists to  
2   lithographic regimes less than approximately 157 nm in an integrated circuit, the  
3   method comprising:  
4                providing a first radiation at a short lithographic wavelength; and  
5                transforming a top portion of a photoresist layer provided over a  
6   substrate in accordance with a pattern on a mask or reticle, wherein the transformed  
7   top portion on top of the photoresist layer includes at least one polymerized area  
8   where the first radiation is incident thereon and comprises the pattern from the mask  
9   or reticle.

1           19.    The method of claim 18, further comprising providing a second  
2   radiation at a long lithographic wavelength after providing a first radiation, wherein  
3   the short lithographic wavelength is smaller than the long lithographic wavelength.

1           20.    The method of claim 19, wherein the mask or reticle is omitted at a  
2   second radiation step.

1           21.    The method of claim 19, wherein the second radiation is not  
2   transmitted through the polymerized area.

1           22.    The method of claim 21, further comprising patterning the photoresist  
2   layer in accordance with each of a plurality of polymerized areas on top of the  
3   photoresist layer and the second radiation, wherein the resolution of the patterned

- 4 photoresist layer is determined by the short lithographic wavelength of the first
- 5 radiation.

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